PB-240 520

LILY LAKE, BLUE EARTH COUNTY, MINNESOTA

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center,
Las Vegas, Nevada
Minnesota Pollution Control Agency
Minnesota National Guard

November 1974

DISTRIBUTED BY:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

I

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	PB 240 520

4. TITLE AND SUBTITLE
Report on Lily Lake, Blue Earth County, Minnesota

5. REPORT DATE
Prepared November 1974

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
Anonymous (National Eutrophication Survey Staff)

8. PERFORMING ORGANIZATION REPORT NO.
Working Paper # 107

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Pacific Northwest Environmental Research Laboratory
U.S.Environmental Protection Agency
200 S. W. 35th St.
Corvallis, Oregon 97330

10. PROGRAM ELEMENT NO.
1BA029

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
Office of Research and Development
U.S. Environmental Protection Agency
401 M Street, S. W.
Washington, DC 20460

13. TYPE OF REPORT AND PERIOD COVERED
Final - 1972

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114

16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

PRICES SUBJECT TO CHANGE

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
Release unlimited		30
	20. SECURITY CLASS *(This page)*	22. PRICE
		$3.75

EPA Form 2220-1 (9-73)

II

REPORT
ON
LILY LAKE
BLUE EARTH COUNTY
MINNESOTA

EPA REGION V

WORKING PAPER No. 107

WITH THE COOPERATION OF THE

MINNESOTA POLLUTION CONTROL AGENCY

AND THE

MINNESOTA NATIONAL GUARD

NOVEMBER, 1974

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Minnesota Pollution Control Agency for professional involvement and to the Minnesota National Guard for conducting the tributary sampling phase of the Survey.

Grant J. Merritt, Director of the Minnesota Pollution Control Agency, John F. McGuire, Chief, and Joel G. Schilling, Biologist, of the Section of Surface and Groundwater, Division of Water Quality, provided invaluable lake documentation and counsel during the course of the Survey; and the staff of the Section of Municipal Works, Division of Water Quality, were most helpful in identifying point sources and soliciting municipal participation in the Survey.

Major General Chester J. Moeglein, the Adjutant General of Minnesota, and Project Officer Major Adrian Beltrand, who directed the volunteer efforts of the Minnesota National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

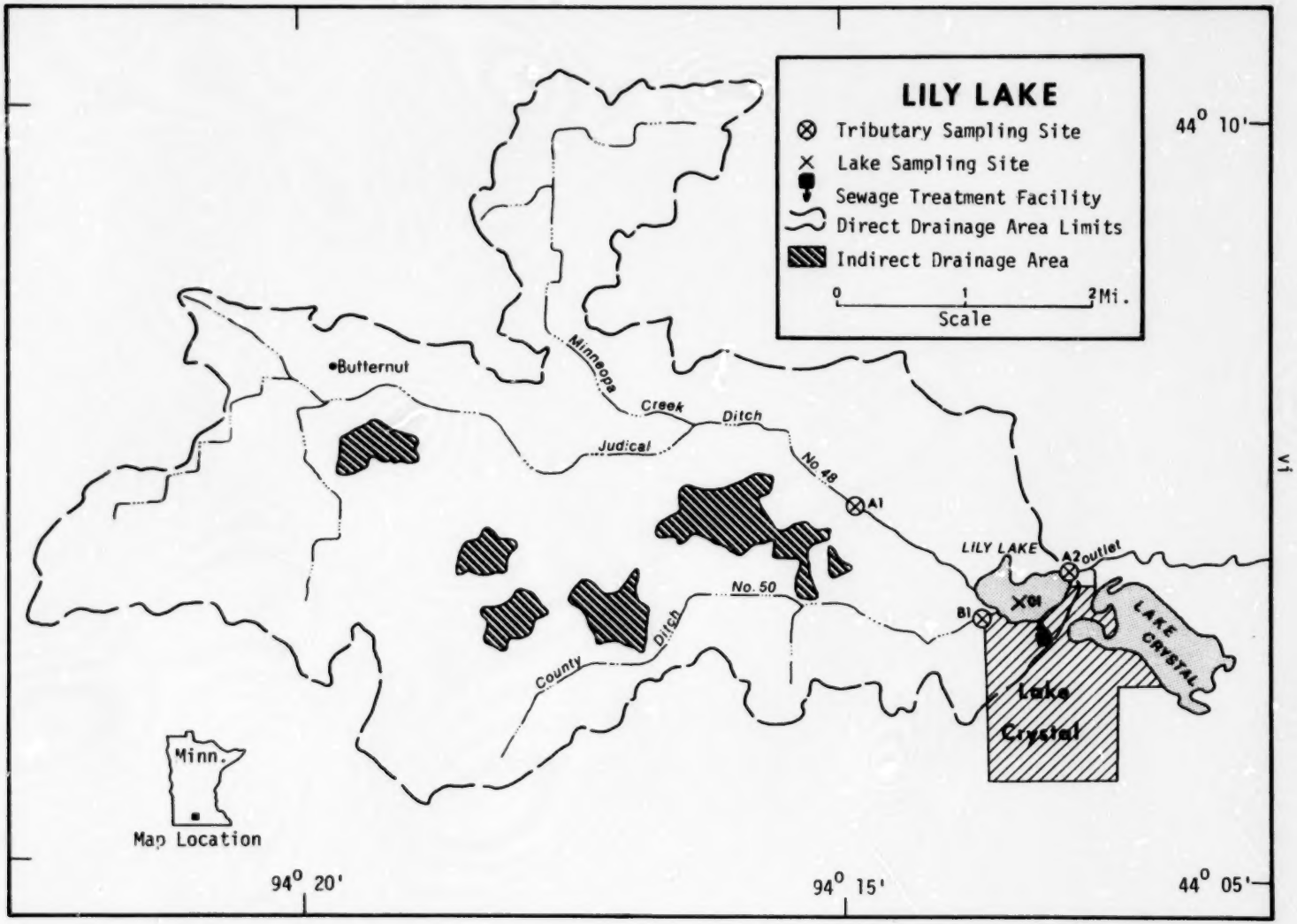
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF MINNESOTA

LAKE NAME	COUNTY
Albert Lea	Freeborn
Andrusia	Beltrami
Badger	Polk
Bartlett	Koochiching
Bear	Freeborn
Bemidji	Beltrami
Big	Stearns
Big Stone	Big Stone, MN; Roberts, Grant, SD
Birch	Cass
Blackduck	Beltrami
Blackhoof	Crow Wing
Budd	Martin
Buffalo	Wright
Calhoun	Hennepin
Carlos	Douglas
Carrigan	Wright
Cass	Beltrami, Cass
Clearwater	Wright, Stearns
Cokato	Wright
Cranberry	Crow Wing
Darling	Douglas
Elbow	St. Louis
Embarass	St. Louis
Fall	Lake
Forest	Washington
Green	Kandiyohi
Gull	Cass
Heron	Jackson
Leech	Cass
Le Homme Dieu	Douglas
Lily	Blue Earth
Little	Grant
Lost	St. Louis

LAKE NAME	COUNTY
Madison	Blue Earth
Malmedal	Pope
Mashkenode	St. Louis
McQuade	St. Louis
Minnetonka	Hennepin
Minnewaska	Pope
Mud	Itasca
Nest	Kandiyohi
Pelican	St. Louis
Pepin	Goodhue, Wabasha, MN; Pierce, Pepin, WI
Rabbit	Crow Wing
Sakatah	Le Sueur
Shagawa	St. Louis
Silver	McLeod
Six Mile	St. Louis
Spring	Washington, Dakota
St. Croix	Washington, MN; St. Croix, Pierce, WI
St. Louis Bay	St. Louis, MN; Douglas, WI
Superior Bay	St. Louis, MN; Douglas, WI
Swan	Itasca
Trace	Todd
Trout	Itasca
Wagonga	Kandiyohi
Wallmark	Chisago
White Bear	Washington
Winona	Douglas
Wolf	Beltrami, Hubbard
Woodcock	Kandiyohi
Zumbro	Olmstead, Wabasha


LILY LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Direct Drainage Area Limits
Indirect Drainage Area
0 1 2 Mi.
Scale
44° 10'
Butternut
Minneopa Creek
Judical Ditch No. 48
A1
LILY LAKE
A2 outlet
X01
B1
No. 50 Ditch
County Ditch
LAKE CRYSTAL
Lake Crystal
Minn.
Map Location
94° 20'
94° 15'
44° 05'

LILY LAKE

STORET NO. 2747

I. CONCLUSIONS

A. Trophic Condition:

Survey data show that this very shallow lake is eutrophic. With a maximum depth of about six feet, it is quite unlikely that Lily Lake could be anything but eutrophic regardless of cultural influences.

Of the 80 Minnesota lakes sampled, only 15% had a greater mean total phosphorus, only 20% had a greater mean dissolved phosphorus, only 8% had less Secchi disc transparency, only 4% had more mean chlorophyll a, but 55% had greater mean inorganic nitrogen.

B. Rate-Limiting Nutrient:

No algal assay sample was collected; however, the lake data show nitrogen limitation in July and late August, 1972 (N/P ratios were less than 1/1).

C. Nutrient Controllability:

During the sampling year, there was an unexpected loss of phosphorus from Lily Lake; i.e., about 49% more phosphorus was measured leaving the lake at the outlet station (A-2; see map, page vi) than can be accounted for by all measured and estimated inputs.

The cause of this marked imbalance is not known, but it is evident that a more intensive study of nutrient sources is needed.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 142 acres.
2. Mean depth: 3 feet.
3. Maximum depth: 6 feet.
4. Volume: 426 feet.
5. Mean hydraulic retention time: 20 days.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
Minneopa Creek	30.8 mi^2	7.6 cfs
County Ditch #50	10.4 mi^2	2.5 cfs
Minor tributaries & immediate drainage -	2.2 mi^2	0.5 cfs
Totals	43.4 mi^2	10.6 cfs

2. Outlet -

Minneopa Creek	43.6 mi^2**	10.6 cfs

C. Precipitation***:

1. Year of sampling: 29.7 inches.
2. Mean annual: 25.4 inches.

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† Schilling, 1974.
* Drainage areas are accurate within ±5%; mean daily flows are accurate within ±10%; and ungaged flows are accurate within ±10 to 25% for drainage areas greater than 10 mi^2.
** Includes area of lake.
*** See Working Paper No. 1, "Survey Methods".

III. LAKE WATER QUALITY SUMMARY

Lily Lake was sampled two times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, near-surface samples for physical and chemical parameters were collected from a single station on the lake (see map, page vi). Also, during each visit a single sample was collected for phytoplankton identification and enumeration, and a separate sample was taken for chlorophyll *a* analysis. Lily Lake was not sampled a third time, and no sample was collected for algal assays.

The results obtained are presented in full in Appendix B and are summarized below. The values presented in these summary tables are not volume-weighted; nonetheless, they are useful as a general guide to differences in water quality at the different sampling times.

A. Physical and chemical characteristics:

Parameter	Values: 1st Sample (07/01/72)	Values: 2nd Sample (08/30/72)
Temperature (Cent.)	24.2	22.0
Dissolved oxygen (mg/l)	10.6	9.2
Conductivity (µmhos)	455	610
pH (units)	8.9	8.6
Alkalinity (mg/l)	131	236
Total P (mg/l)	0.374	0.840
Dissolved P (mg/l)	0.142	0.453
NO_2 + NO_3 (mg/l)	0.080	0.150
Ammonia (mg/l)	0.060	0.180
Chlorophyll *a* (µg/l)	188.4	269.9
Secchi disc (inches)	16	6

Parameter	Min. for all samples	Max. for all samples	Mean for all samples
Temperature	22.0	24.2	23.1
Dissolved oxygen	9.2	10.6	9.9
Conductivity	455	610	533
pH	8.6	8.9	8.8
Alkalinity	131	236	184
Total P	0.374	0.840	0.607
Dissolved P	0.142	0.453	0.297
$NO_2 + NO_3$	0.080	0.150	0.115
Ammonia	0.060	0.180	0.120
Chlorophyll a	188.4	269.9	229.1
Secchi disc	6	16	11

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
07/01/72	1. Oscillatoria	24,728
	2. Scenedesmus	7,817
	3. Flagellates	6,362
	4. Cyclotella	4,000
	5. Gloeocapsa	3,635
	Other genera	14,913
	Total	61,455
08/30/72	1. Cyclotella	16,362
	2. Melosira	11,544
	3. Oscillatoria	9,273
	4. Gloeocapsa	7,273
	5. Nitzschia	5,273
	Other genera	9,455
	Total	59,180

2. Chlorophyll *a* -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
07/01/72	01	188.4
08/30/72	01	269.9

IV. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the Minnesota National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the high runoff months of March and May, when two samples were collected, and the colder months when samples were omitted at two stations because of low flows. Sampling was begun in October, 1972, and was completed in September, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Minnesota District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated by using the nutrient loads, in lbs/mi^2/year, in County Ditch #50 at station B-1 and multiplying by the ZZ area in mi^2.

The operator of the Lake Crystal wastewater treatment plant provided monthly effluent samples and corresponding flow data.

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* See Working Paper No. 1.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (mgd)	Receiving Water
Lake Crystal	1,626*	Trickling filter	0.220	Lily Lake

2. Known industrial - None

* 1970 Census.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Minneopa Creek	2,810	30.0
County Ditch #50	840	9.0
b. Minor tributaries & immediate drainage (non-point load) -	180	1.9
c. Known municipal -		
Lake Crystal	4,490	58.9
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	20	0.2
Total	8,340	100.0

2. Outputs -

Lake outlet - Minneopa Creek 12,460

2. Net annual P loss - 4,120 pounds

* See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Minneopa Creek	136,350	64.8
County Ditch #50	44,990	21.4
b. Minor tributaries & immediate drainage (non-point load) -	9,520	4.5
c. Known municipal -		
Lake Crystal	15,040	8.6
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	1,370	0.7
Total	207,270	100.0

2. Outputs -

Lake outlet - Minneopa Creek 218,170

3. Net annual N loss - 10,900 pounds

* See Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs $P/mi^2/yr$	lbs $N/mi^2/yr$
Minneopa Creek	91	4,427
County Ditch #50	81	4,326

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving waters would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	58.7	loss	1,459.6	loss
grams/m^2/yr	6.58	-	163.6	-

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Lily Lake:

"Dangerous" (eutrophic rate)	0.78
"Permissible" (oligotrophic rate)	0.39

V. LITERATURE REVIEWED

Anonymous, 1973. Wastewater disposal facilities inventory. MPCA, Minneapolis.

Schilling, Joel, 1974. Personal communication (morphometry of Lily Lake). MPCA, Minneapolis.

Vollenweider, Richard A., (in press). Input-output models. Schweiz. A. Hydrol.

VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR MINNESOTA 10/30/74

LAKE CODE 2747 LILY LAKE

TOTAL DRAINAGE AREA OF LAKE 43.60

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2747A1	30.80	0.42	0.59	6.14	29.20	14.80	20.70	8.18	4.13	3.15	2.06	1.67	0.75	7.64
2747A2	43.60	0.60	0.85	8.97	41.90	20.90	27.00	11.40	5.77	4.28	2.85	2.36	1.03	10.65
2747B1	10.40	0.15	0.18	2.64	9.31	4.80	7.06	2.65	1.18	1.04	0.60	0.46	0.25	2.52
2747ZZ	2.20	0.02	0.02	0.37	1.87	1.02	1.59	0.58	0.34	0.25	0.12	0.08	0.04	0.52

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 43.60
SUM OF SUB-DRAINAGE AREAS = 43.40

TOTAL FLOW IN = 128.41
TOTAL FLOW OUT = 127.91

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2747A1	10	72	2.03	15	1.20				
	11	72	4.73	5	11.00				
	12	72	1.40	4	2.40				
	1	73	2.23	13	0.80				
	2	73	2.35	4	4.80				
	3	73	24.40	3	12.00				
	4	73	12.00	24	9.40				
	5	73	17.30	16	12.60	31	24.00		
	6	73	6.21						
	7	73	0.82	12	0.70				
	8	73	0.33						
	9	73	0.41	2	0.40				
2747A2	10	72	2.81	15	1.70				
	11	72	6.66	5	16.00				
	12	72	1.94	4	3.30				
	1	73	3.19	13	1.20				
	2	73	3.39	4	4.00				
	3	73	35.70	3	18.00				
	4	73	17.20	24	13.00				
	5	73	24.40	16	18.00	31	34.00		
	6	73	8.10						
	7	73	1.14	12	0.90				
	8	73	0.46						
	9	73	0.56	2	0.55				

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TRIBUTARY FLOW INFORMATION FOR MINNESOTA 10/30/74

LAKE CODE 2747 LILY LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
274781	10	72	0.59	5	0.40				
	11	72	1.29	5	3.00				
	12	72	0.46	4	0.80				
	1	73	0.80	13	0.30				
	2	73	0.72	4	0.90				
	3	73	10.50	3	5.40				
	4	73	3.82	24	3.00				
	5	73	5.62	16	4.10	31	7.80		
	6	73	2.12						
	7	73	0.27	12	0.22				
	8	73	0.09						
	9	73	0.14	2	0.14				
2747ZZ	10	72	0.11	15	0.06				
	11	72	0.22	5	0.50				
	12	72	0.07	4	0.10				
	1	73	0.11	13	0.04				
	2	73	0.08	4	0.10				
	3	73	1.47	3	0.80				
	4	73	0.77	24	0.60				
	5	73	1.19	16	0.90	31	1.60		
	6	73	0.48						
	7	73	0.06	12	0.05				
	8	73	0.03						
	9	73	0.03	2	0.03				

14

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/10/30

274701
44 07 00.0 094 13 30.0
LAKE LILY
27013 MINNESOTA

11FPALES 2111202
S 0002 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/07/01	07 30	0000	24.2	10.6	16	455	8.90	131	0.080	0.060	0.374	0.142
72/08/30	13 15	0000	22.6	9.2	6	610	8.65	236	0.150	0.180	0.840	0.453

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLOROPHYL A UG/L
72/07/01	07 30	0000	184.91
72/08/30	13 15	0000	269.91

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APPENDIX C

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET-RETRIEVAL DATE 74/10/30

2747A1 LS2747A1
44 07 30.0 094 15 00.0
MINNEOPA CREEK
27 15 MANKATO WEST
I/LILY LAKE
CO HWY 111 BRDG 1 MI UPSTREAM OF LILY LK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/15	14 00		1.560	0.840	0.140	0.048	0.107
72/11/05	10 00		5.200	2.520	0.064	0.089	0.230
72/12/04			0.028	0.990	0.054	0.005K	0.011
73/03/03	10 00		5.300	3.990	0.590	0.410	0.700
73/03/23	14 00		11.000	2.900	0.350	0.046	0.110
73/04/24	14 50		16.400	1.150	0.020	0.042	0.100
73/05/16	08 30		15.200	1.600	0.115	0.050	
73/05/31	09 00		17.000	1.400	0.066	0.029	0.155
73/07/12	10 00		5.900	1.540	0.147	0.076	0.135
73/09/02	14 30		0.500	3.400	0.147	0.210	0.345

K VALUE KNOWN TO BE LESS
THAN INDICATED

81

STORET RETRIEVAL DATE 74/10/30

2747A2 LS2747A2
44 07 00.0 094 13 00.0
MINNEOPA CREEK
27 15 MANKATO WEST
O/LILY LAKE
CO HWY 20 BRDG AT OUTLET OFLILY LAKE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/15	13 30		0.016	4.485	0.102	0.084	0.165
72/11/05	10 00		1.110	3.600	0.067	0.132	0.460
72/12/04			15.500	0.100K	0.042	0.042	0.063
73/01/13	11 00		9.450	7.300	4.800	1.700	2.100
73/02/04	09 00		5.000	4.900	2.600	0.970	1.300
73/03/03	11 30		5.600	2.900	0.890	0.310	0.430
73/03/23	13 30		9.200	5.100	0.600	0.273	0.400
73/04/24	20 00		10.000	2.600	0.026	0.044	0.220
73/05/16	08 00		10.300	3.100	0.098	0.066	0.970
73/05/31	09 30		14.000	0.805	0.250	0.037	0.135
73/07/12	11 08		0.026	5.500	0.096	0.350	0.720
73/09/02	14 50		0.021		0.160	0.420	1.050

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/30

274781 LS274781
44 06 30.0 094 14 00.0
UNNAMED STREAM
27 15 MANKATO WEST
T/LILY LAKE
CO HWY 6 XING NW OF LK CRYSTAL
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/15	13 45		1.370	0.400	0.031	0.034	0.060
72/11/05	10 00		3.200	0.150	0.048	0.115	0.160
72/12/04			12.800		0.308	0.048	0.063
73/03/03	09 00		0.357	4.500	0.900	0.022	
73/03/23	13 00		14.000	4.400	1.105	0.086	0.155
73/04/24	09 00		17.000	0.260	0.040	0.084	0.185
73/05/16	09 00		15.200	4.300	0.100	0.120	0.600
73/05/31	09 15		19.000		0.032	0.026	0.105
73/07/12	10 30		6.400	2.200	0.096	0.056	0.200
73/09/02	15 00		0.850	2.100	0.176	0.105	0.210

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STORET RETRIEVAL DATE 74/10/30

274751 TF274751 P001807
44 05 30.0 094 13 00.0
LAKE CRYSTAL
27013 W MANKATO
D/LILY LAKE
LILY LAKE
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00625 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/22	11 00								
CP(T)-								0.220	
73/01/22	13 00								
73/02/24	11 00								
CP(T)-			1.700	30.400	17.200	5.900	8.500	0.200	0.225
73/02/24	13 00								
73/03/27			2.100	17.000	4.460	4.950	5.400		
73/04/24	09 00		4.700	9.700	0.220	3.800	5.000	0.200	
73/05/21	14 00		4.700	18.400	5.300	5.100	11.000		0.225
73/06/21	11 00		4.200	13.400	1.100	5.100	6.000	0.225	0.225
73/07/30	19 00		1.470	25.000	7.300	2.550	6.660	0.250	0.250
73/08/24	11 00		0.730	22.000	9.300	4.740	7.000	0.200	0.200
73/09/26	09 30		0.670	13.200	2.100	4.200	5.500	0.225	0.225
73/10/28	09 00		0.120	28.000	15.000	2.100	8.300	0.200	0.200
73/11/21	16 00		0.900	33.000	15.500	3.900	11.000	0.220	0.220
73/12/26	09 30		1.050	27.000	12.500	6.100	6.600	0.225	0.225
74/01/29	09 00		2.150	19.500	4.800	6.600	9.600	0.220	0.220

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